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(Eds.)

Statistical Atlases and Computational Models of the Heart

First International Workshop, STACOM 2010 and
Cardiac Electrophysiological Simulation Challenge, CESC 2010
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Preface

Recently, there has been considerable progress in the construction and application of cardiac atlases and computational models which integrate heart shape, function, and physiology. Several major initiatives have identified computational and morphological atlases as a major infrastructural platform, for instance the Physiome project and the European Virtual Physiological Human project. Non-invasive cardiovascular imaging plays an important role in defining the computational domain, the boundary/initial conditions, and tissue function and properties. Hence, one of the most important current challenges in the field is the development of robust and effective methods for the parameterization and personalization of these computational models using only minimally-invasive clinical imaging. However, in order to evaluate the model output and achieve clinical impact, such personalized models have to be both augmented with and compared to generic knowledge on the healthy and pathological heart. This knowledge can be acquired through the building of statistical models of the heart. Several efforts are now established to provide web-accessible structural and functional atlases of the normal and pathological heart for clinical, research, and educational purposes. We believe all these approaches will only be effectively developed through collaboration across the full research scope of the imaging and modeling communities.

Integrative models of cardiac function are important for understanding disease, evaluating treatment, and planning intervention. To provide a focus for the developing array of techniques which underpin the application of these models in the clinic a simulation challenge was included in the workshop. The goal of this challenge was to compare strategies for the personaliszation of different cardiac computational models with experimental data. A complete dataset was provided in advance, containing the cardiac geometry and fibre orientations from MRI as well as epicardial transmembrane potentials from optical mapping. Participants submitted personalized models and resulting isochrones, in order to allow a discussion on the different personalization strategies and results.

This workshop provides a forum for the discussion of the latest developments in the areas of heart mapping, including atlas construction, statistical modeling of cardiac function across patient groups, cardiac computational physiology, model personalization, ontological schemata for data and results, atlas-based functional analysis, and integrated functional/structural analyses. It also brings together experts in cardiology, radiology, biology, and physiology. Through this workshop we would also particularly like to engage a new generation of early-career researchers in working at this interface.

September 2010

Oscar Camara, Mihaela Pop
Kawal Rhode, Maxime Sermesant
Nic Smith, Alistair Young

Organization

We would like to thank the Program Committee, the additional reviewers, and all the participants who made this first workshop of its type a great success. We would especially like to thank the industrial sponsors Siemens AG, Siemens Corporate Research, and Scimedia/Brainvision.

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Sponsoring Institutions

The workshop was sponsored by Siemens AG, Siemens Corporate Research, and Scimedia/Brainvision. The challenge was endorsed by the euHeart FP7 European Project.

Table of Contents

Keynote Presentations

Methods and Infrastructure for Atlas Construction

Structure and Flow

Mechanics and Motion

Electrophysiology and Electrical Activation

Computational Electrophysiological Simulation Challenge (CESC 2010)